Connection element

The invention relates to a connection element for connecting constructional components or the like mechanically, having the features of the preamble of claim 1.

Connection elements of such a kind are known, for example, from DE 100 26 769 A1. In that case, as part of pre-assembly, one coupling half is attached by means of screws to each of two constructional components or the like to be connected. In order to connect the constructional components, the coupling halves are brought into engagement. For that purpose they have a centring device provided with wedge-shaped or conical engaging elements. Within the coupling halves there are additionally arranged line connection elements for water, gas, electricity or the like so that, in the process of mechanical connection, a connection of the utility is produced at the same time. In the case of extremely heavy constructional components such as, for example, walls in prefabricated building construction, the connection elements have to take very heavy loads. Because of a lack of evenness in the floor slab it may happen that a complete wall is, in the installed state, carried by two adjacent walls. In addition to those forces of weight, significant forces of inertia and jolts occur in the installation of prefabricated building walls. The time required for installation always plays an important part. Because of the complex construction of the known connection elements, which allow economical formation only in plastics or cast aluminium, such requirements relating to mechanical loadability cannot be met.

The invention is based on the problem of providing a highly stable connection element which allows rapid installation of the constructional components to be connected, especially in combination with the connection elements known from DE 100 26 769 A1.

The problem is solved in accordance with the invention by the features of claim 1. The coupling halves comprise tubular parts, which by virtue of having different cross-sections, can be inserted one into the other. Those parts can be, for example,

standard tetragonal tubes made from steel. In the context of the invention, the term "tubular parts" applies equally to all parts whose cross-sections are suitable for longitudinal guidance, that is to say, for example, includes the combination of a flat steel member or a member having an I, C or T profile with a tubular part, in which case the latter can of course also have a longitudinal slot corresponding to a profiled rail or can be reduced to one or more eyelets. Also included are tongue-and-groove cross-sections, which by virtue of an undercut are suitable for longitudinal guidance. Roller systems or lubricating systems can assist that guidance property.

The tubular parts are arranged at an angle to the contact faces of the constructional components. When one tubular part is introduced into the other, a combined movement of the constructional components perpendicular and parallel to their contact faces is performed as a result. The introduction distance is not limited by the coupling halves but is terminated as soon as the contact faces of the constructional components come into contact with one another. The coupling halves are so arranged on the constructional components that the coupling half is attached to the fixed constructional component so that the tubular part is pointing upwards at an angle whereas the other constructional component to be joined thereto has a tubular part which points downwards. As a result, the gravitational force of the constructional component being joined thereto can be utilised when joining the constructional components. As a result of arrangement of the tubular parts at an angle, the constructional components are positively guided and are ultimately located with their contact faces flush against one another. As a result, in contrast to connection elements which provide a joining direction perpendicular or parallel to the contact faces, the advantage is obtained that there is no need for the constructional components to be additionally clamped together after joining. When the connection elements according to the invention are used in combination with the connection elements known from DE 100 26 769 A1, the further advantage is obtained that the connection elements according to the invention take up the weight and joining forces during and after joining whilst the load on the connection elements of DE 100 26 769 A1 is reduced so that these can be of less robust construction. As a result of the positive guidance of the connection elements according to the invention, the connection elements of DE 100 26 769 A1 are also moved one towards the other in such a way that their centring devices undergo an at most slight compensatory movement, combined with low forces.

In a preferred embodiment, the tubular part of smaller cross-section comprises an insertion cap. As a result of the insertion slopes produced thereby, the coupling halves can be readily joined together even when the possibilities for positioning are very approximate. This is important, for example, when connecting walls in prefabricated building construction as in that case it is necessary, under certain circumstances, for very large wall elements suspended from a crane to be joined together.

For mounting the tubular parts at an angle on the constructional components, the coupling halves in a preferred embodiment comprise wedge-shaped plinths, for example made from plastics material, which support the tubular parts. The coupling halves are fastened to the constructional components by means of screws. In order to achieve a direct flow of force from the tubular parts into the constructional component in question by way of the screws, the screws abut, at their heads, that inside face of the tubular parts which faces the constructional component and extend through the plinth and into the constructional component.

In order to be able to adjust the connection of the two constructional components in a direction transverse to the joining direction of the connection elements, for example in order to compensate for production-related inaccuracies, one embodiment of the invention comprises an adjusting element between the tubular parts, having displacing means in a direction transverse to the longitudinal direction of the tubular parts. As a result thereof, the position of the inner tubular part relative to the outer tubular part can still be adjusted when the constructional components are being joined. Preferably, the adjusting element comprises a sheet-metal strip bent into a cap shape, which in addition to the adjusting function also has a joining function analogous to the above-mentioned insertion cap. As displacing means there are proposed two threaded bolts, which are mounted, for example, by means of a slide mounting, in the sheet-metal strip, their threads engaging in threaded holes in the inner tubular part. The bolts can be turned by means of externally arranged tool application means, such as, for example, a hexagon socket. As a result of turning the bolt, the adjusting element is displaced relative to the tubular part.

In order to achieve a flow of force that is as short as possible and also low moment effects between the coupling halves, a preferred embodiment of the invention comprises a mountable force-directing means, which is so arranged on the outer

tubular part that the inner tubular part, which is in contact in the region of the force-directing means, transfers forces where the outer tubular part is best able to take them up, that is to say, for example, at its end facing the inner tubular part. Preferably, the force-directing means are simple sheet-metal parts bent into a U-shape.

The invention is described below in greater detail with reference to three exemplary embodiments illustrated in the drawings, in which:

Figure 1 is a cross-section through the connection element of a first exemplary embodiment in the installed state;

Figure 2 is a cross-section through the tubular parts of a second exemplary embodiment of the connection element;

Figure 3 is a perspective view of a third exemplary embodiment of the invention.

The connection element 1 shown in Figure 1 is used for connecting the two constructional components 2 and 3, for example two walls being connected in prefabricated building construction, and consists of the two coupling halves 4 and 5, which are fastened to the respective constructional component 2, 3 by means of screws 6. Each of the two coupling halves 4, 5 has a tubular part 7, 8, supported by wedge-shaped plinths 9, 10 made from a high-strength plastics material. The tubular parts 7, 8 are standard tetragonal tubes made from steel, which have different cross-sections and can be inserted one into the other.

For connecting the two constructional components 2, 3, the coupling halves 4, 5 are first fastened to the constructional components 2, 3 by means of screws 6 as part of pre-assembly. For that purpose, the screws 6 are pushed through the holes 11 and, when they are screwed in, the heads 12 of the screws ultimately come into abutment against the inside faces 13, 14. For the actual joining of the constructional components 2, 3, the coupling half 5 having the tubular part 8 of larger cross-section is placed over the coupling half 4 having the tubular part 7 of smaller cross-section, the insertion cap 15 serving to form slopes for joining. During joining of the constructional components 2, 3, they make a combined movement perpendicular and parallel to their contact faces 16. The joining movement is assisted by gravity and is complete at the

moment when the contact faces 16 touch. In that state, the coupling halves 4, 5 are clamped together by virtue of their wedging action and gravity.

Figure 2 shows the tubular parts 7a, 8 of a second exemplary embodiment in section. Arranged between the tubular parts 7a, 8 is an adjusting element 17. The adjusting element 17 comprises a sheet-metal strip 18 bent into a cap shape and also two displacing means in the form of bolts 19. The bolts 19 have threads 20 and, at both ends, have hexagon sockets 21 as tool application means. They are, in each case, mounted in holes 22 in the sheet-metal strip and engage in threaded holes 23 in the inner tubular part 7a. For as long as the tubular parts 7a, 8 are not yet in engagement, the bolts 19 can be turned in parallel and, as a result, the sheet-metal strip 18 is displaced relative to the inner tubular part 7a in a direction transverse to its longitudinal direction. Because the adjusting element 17 is in turn inserted in the outer tubular part 8, the shown offset A of the central axes can, for example, be adjusted as desired.

Figure 3 shows a further exemplary embodiment of the connection element 1b according to the invention. It consists of the two coupling halves 4b and 5b. Each of the two coupling halves 4b, 5b has a tubular part 7b, 8b, the tubular part 7b being in the form of a flat steel member having insertion slopes 24. The tubular parts 7b, 8b are in turn supported by wedge-shaped plinths 9b, 10b made from plastics material. Mounted on those edges 25 of the outer tubular part 8b which face the other coupling half 4b are force-directing means 26 in the form of sheet-metal parts bent into a U-shape, which cause the forces acting between the coupling halves to be transferred in their immediate vicinity and, as a result, relatively large leverage effects are especially avoided.